



Analysis of Learning Difficulties in Biochemistry Practicum Courses

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Abstract

The Covid-19 pandemic has caused biochemistry practicum courses for biology education students to move online, leading to new difficulties. This descriptive qualitative study of 245 students from the 2018-2020 Batch in the biology education program at the University of Jambi found that students faced challenges with difficult biochemical materials, obtaining materials, and poor internet signals. Additionally, students struggled with comprehending the relationship between experimental processes and theory taught in class, and understanding practicum guidelines. The study underscores the need for solutions to improve biochemistry learning, particularly online, to enhance students' understanding of the subject matter

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Introduction:

Biology learning cannot be separated from other science materials such as chemistry materials. Chemical material is very closely related to biological material because it is one of the foundations for studying chemical processes in life such as molecular, cell, physiology, and biochemistry biology (Puspitasari, 2019). Biochemistry is the study of chemical composition, the structure of substances, and their transformation in living bodies or often referred to as metabolic processes (Butnariu & Sarac, 2018). Biochemistry material includes understanding or introduction to biochemistry, molecular biology, enzymes, metabolism, gene expression, and replication (Voet et al., 2016). Biochemistry material in more detail, including discussing 1) the structure and function of proteins and enzymes, 2) the mechanism and regulation of enzyme action, 3) the metabolism of carbohydrates, lipids, proteins, and amino acids, 4) the structure, function, and replication of macromolecules, 5) biochemistry of communication extracellular and intracellular (Rodwell et al., 2018).

Biology education students are required to take biochemistry courses and biochemistry labs. The biochemistry practicum course functions to support students' understanding of the theory taught by lecturers. Practicum is a very important learning activity in increasing students' understanding of the material being taught (Ariyati, 2010; Baeti et al., 2015). Practical activities are presented using experiments (Suryaningsih, 2017). The material presented includes the identification of proteins, carbohydrates, amino acids, and lipids, as well as observations of enzyme activity by utilizing various materials around students (Qonita et al., 2021).

Typically, biochemistry practicum activities are conducted face-to-face or offline, but due to the Covid-19 pandemic, learning activities have been transitioned to online mode. The Covid-19 pandemic, caused by the Sars-Cov2 virus, has affected the entire world (Balkhair, 2020; Benvenuto et al., 2020; Mahase, 2020), including the education sector. Online learning has become the norm in almost all parts of the world as a response to the pandemic (Bao, 2020; Goldschmidt, 2020). This raises new difficulties or challenges in learning.

Learning success can be fulfilled if students have talent, desire, and perseverance in learning accompanied by a quality teaching process (Dimyati & Mudjiono, 2009). Students who want to excel in the learning process must be able to deal with various problems that occur during the learning process. If students cannot overcome their problems in learning, it can be said that they have difficulty learning (Subekti & Jazuli, 2020). Learning difficulties or challenges are the emergences of obstacles in learning experienced by students that lead to the non-fulfillment of learning objectives (Faika & Side, 2011). Learning difficulties are based on learning motivation, the role of lecturers and students in the learning process, learning materials, and the learning environment (Hermayawati, 2010). Learning difficulties can also be classified into two, namely internal factors that come from within and external factors that come from the environment (Saputra & Rohman, 2012).

One of the difficulties and challenges in online learning is how to keep learning activities such as face-to-face learning (Herliandry et al., 2020). Low student learning activity causes a decrease in learning motivation because the class atmosphere tends to be passive and lecturers are more dominant than students (Hidayat & Lesmini, 2015). Diagnosis of learning difficulties can be done by finding and finding learning difficulties, as well as studying the factors of learning difficulties so that efforts can be made to prevent and overcome them (Darimi, 2016). According to research conducted by Dewi (2022), it is known that the results show that learning Biochemistry is still dominated by lecture and discussion methods as well as lecturer-centered activities so students become inactive. This is one of the causes of student learning difficulties. The research results of Kurniawati & Jailani (2020) also stated that the low learning outcomes in Biochemistry courses were caused by students' difficulties in solving problems in Biochemistry such as chemical structures and memorizing material so students' interest in learning was lacking.

Research is required to analyze the difficulties faced by students during biochemistry practicum, both in face-to-face and online learning settings. Overcoming these difficulties is possible through good cooperation between students and lecturers. The lack of good cooperation can create obstacles in the learning process, and without identifying the obstacles, solutions cannot be found, leading to failure to

achieve learning objectives. Hence, analyzing students' learning difficulties in biochemistry practicum is essential, and this study aims to identify these difficulties.

The novelty of this research was (1) This research has the potential to contribute to the development of biochemistry practicum in general. By identifying the difficulties experienced by students, teachers can take better action in improving the quality of learning and designing learning programs that are more effective and efficient. (2) Identify specific problems and challenges. By analyzing learning difficulties, this research identifies specific problems and challenges experienced by students in studying biochemistry practicum courses. Thus, the results of this study can provide valuable insights for teachers and students in addressing these specific problems. (3) This research can become the basis for further research in the field of biochemistry practicum learning. The results of this study can assist teachers and researchers in designing research and learning programs that are more effective and efficient.

Methods:

This study used a qualitative descriptive method which was given to students of Biology Education, Faculty of Teaching and Education, University of Jambi. The population of this study was students from the 2018-2020 class with a total of 245 respondents. Sampling was carried out for students who had carried out face-to-face practicum and students who had carried out face-to-face practicum. This aims to find out the difficulties faced by students both in carrying out face-to-face and online practicum. The questionnaire uses closed and open-question instruments. The questions asked included what material students considered difficult, and what obstacles and problems students faced during the biochemistry practicum. Instruments are distributed online via Google Forms

Result and Discussion:

The results of the research that was carried out by distributing questionnaires to 245 respondents to biology education students from class 2018-2020 found that 22.45% of students had never carried out online biochemistry practicums and 6.12% of students answered absolutely never. This shows that there are students from the 2018-2020 Batch who carry out face-to-face practicums. The face-to-face practicum was carried out before the Covid-19 pandemic spread. Students who carry out practicums offline are Class 2018 students. The results of student answers are presented in Figure 1

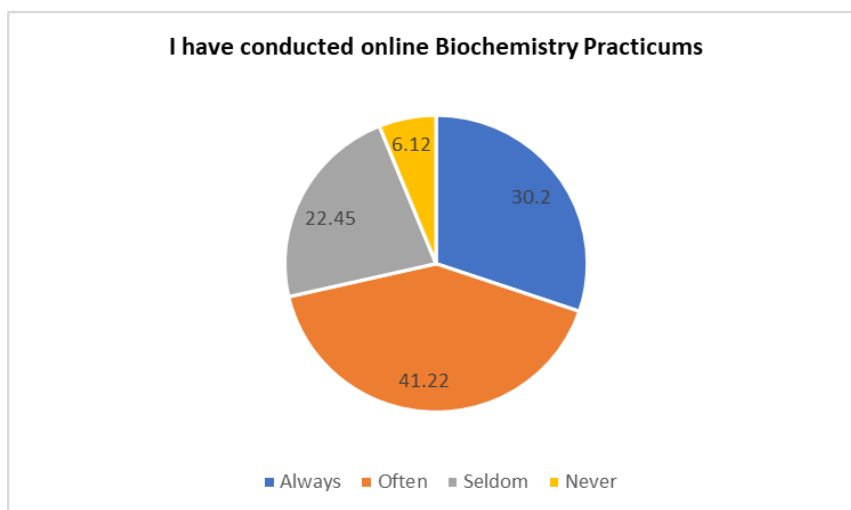


Figure 1. Questionnaire Results for Online Biochemistry Practicum

Furthermore, based on the research results from the questionnaire statements whether or not students had carried out biochemistry labs offline, it was found that 44.90% said they had never and 9.39% said they had never. This shows that there are more students who have never carried out offline learning

compared to students who have done it before. This happened because the average student class of 2019-2020 carried out online biochemistry practicums during the Covid-19 pandemic. The results of the answers are presented in Figure 2.

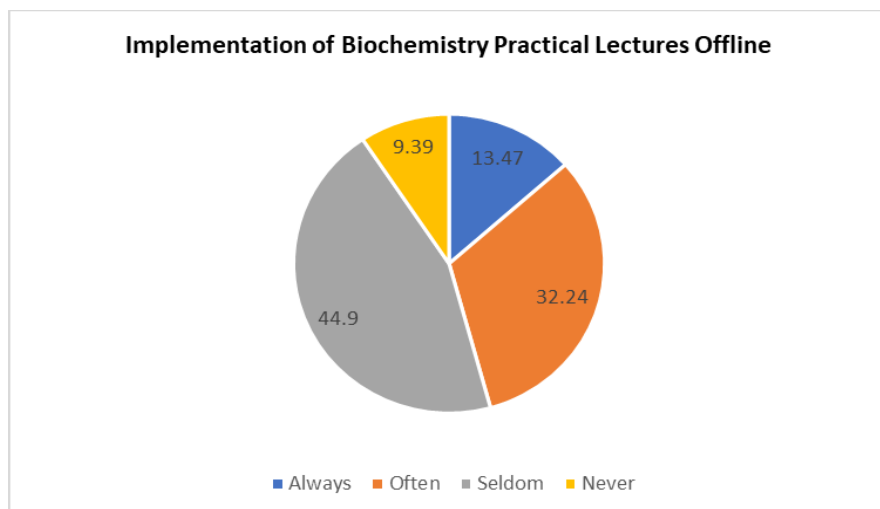


Figure 2. Results of an Offline Biochemistry Practicum Questionnaire

Then, students are given questions about what biochemistry practicum material is considered difficult for students. The research results presented in Figure 3 show that 32.24% answered amino acids, 28.16% lipids, 23.27% enzymes, 8.16% carbohydrates, and 8.16% carbohydrates. Based on the research results, it is known that many students answered material that was difficult to understand, namely amino acids, lipids, and enzymes. This is consistent with the results of the diagnosis of learning difficulties in biochemistry according to Halmo et al., (2018) is the material of amino acids and non-covalent interaction mechanisms such as those that occur in lipids. In addition, aspects of biochemical material that are difficult to understand are about carbohydrate and enzyme metabolism which contain abstract concepts and concepts that express processes so a learning media is needed that makes it easier for students to understand them (Rahmatan, 2016).

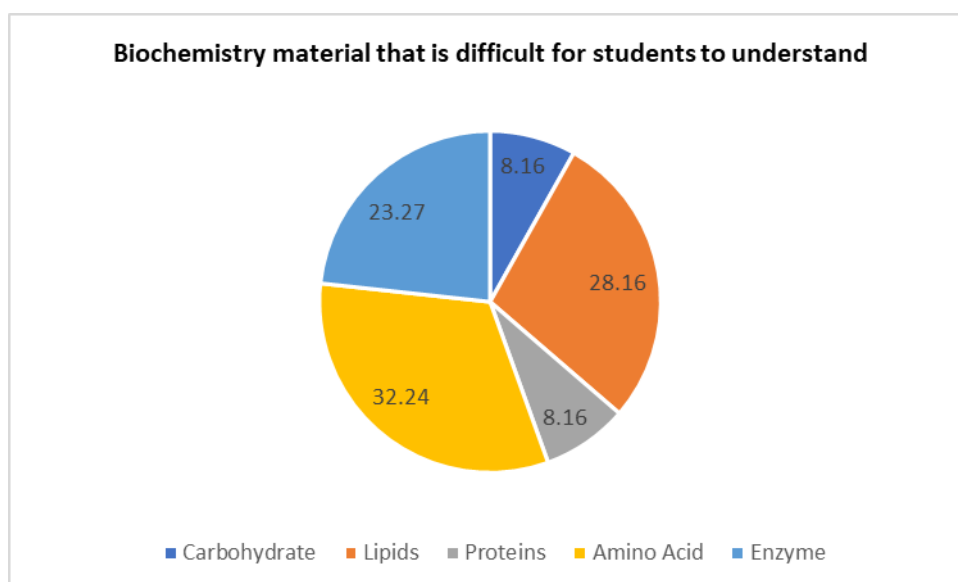


Figure 3. Biochemistry material that is difficult for students to understand

Based on the results of the open questions given to students regarding the constraints and problems

faced by students, it is known that many students still experience problems. The obstacle faced by students who carry out practicums online is the difficulty of finding tools and materials for practicing independently at home. Students stated that some tools and materials were difficult to find around their environment. In addition, students also often fail to carry out biochemistry practicum experiments because no one gives directions during independent practicums, there are also those who state that the signal is sometimes unstable so that only a few of the explanations or directions are given are understood. Students who carry out practicum offline do not understand how the experimental process is carried out in the laboratory with the theory taught in class, and students who carry out practicum face-to-face also have difficulty understanding some of the material in the practicum guide provided.

The existence of various obstacles that occur is expected to provide various solutions so that there is an increase in the quality of learning biochemical material. Solutions that can be provided include remaking practicum guides that make it easier for students to understand them and relate them to learning theory in class. Laboratory facilities are again equipped with adequate tools and materials. If the practicum is carried out online, it is necessary to use or develop learning media that makes it easier for students to understand both biochemistry theory and practicum. It is hoped that these various solutions can be developed in further research so that various learning difficulties can be overcome so that students understand more about Biochemistry material.

Conclusion:

Based on the presentation of the results and discussion, it can be concluded that difficulties in the biochemistry practicum course occur both in the implementation of practicum activities online and offline. The biochemistry materials considered by students to be difficult included amino acids, lipids, and enzymes. This happens because many biochemical materials contain abstract concepts and concepts that express processes so they require learning media that provide an overview of the material. In addition, the obstacles and problems faced by students are the difficulties in finding tools and materials for independent practicum at home, they often fail to carry out biochemistry practicums because no one gives directions during independent practicums, students do not understand how the interrelationships between the experimental processes carried out at laboratory with the theory taught in class, and difficulty understanding some of the material in the practicum guide provided. Therefore, various solutions are needed that can improve the quality of learning biochemistry material so that students understand it better.

Implications that can be identified include: (1) Improving the quality of learning: From the research results, it can be identified the problems or difficulties faced by students in understanding biochemistry practicum material. By knowing these problems, teachers can make improvements to the materials and learning methods that are more effective so as to improve the quality of learning, (2) Improving the effectiveness of assessment: This research can also assist educators in designing and developing more accurate and effective assessment instruments. By knowing the difficulties experienced by students, teachers can adjust questions and assessment instruments that can be more precise in measuring students' understanding of the material. (3) Identify student needs: This research can assist policy makers in understanding the needs and expectations of students in studying biochemistry practicum courses. By knowing the difficulties experienced by students, policy makers can design learning programs that are more in line with the needs of students.

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